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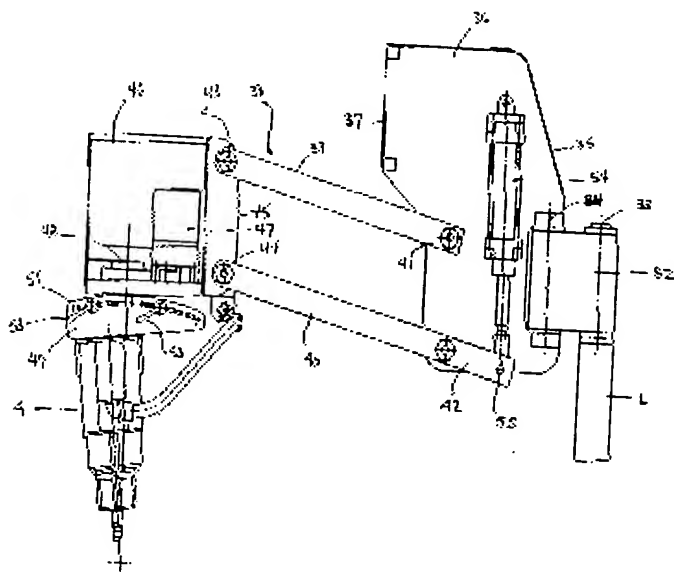
(12) Patent Application:

(54) GRINDING APPARATUS

(11) CA 2313685

(54) DISPOSITIF D'AFFUTAGE

Representative Drawing:



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ABSTRACT:

A grinding apparatus for grinding the hard metal inserts or working tips of drill bits (percussive or rotary), tunnel boring machine cutters (TBM) and raised bore machine cutters (RBM), said grinding apparatus consisting of a box having a table for holding one or more bits to be ground, a grinding machine carried by an arm or lever system journaled on a stand attached to the box, wherein said table is tiltable within box and having means to control the tilting action and wherein the table is provided with one or more apertures to hold one or more bits to be ground.

CLAIMS:

*** Note: Data on abstracts and claims is shown in the official language in which it was submitted.

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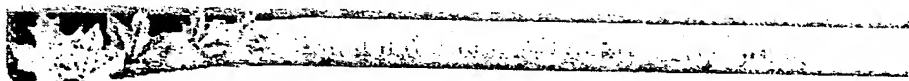
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CLAIMS:

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THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A grinding apparatus for grinding the hard metal inserts or working tips of drill bits (percussive or rotary), tunnel boring machine cutters (TBM) and raised bore machine cutters (RBM), said grinding apparatus consisting of a box having a table for holding one or more bits to be ground, a grinding machine carried by an arm or lever system journaled on a stand attached to the box, wherein said table is tiltably mounted within box and having means to control the tilting action and wherein the table is provided with one or more apertures to hold one or more bits to be ground.
2. A grinding apparatus for grinding the hard metal inserts or working tips of drill bits (percussive or rotary), tunnel boring machine cutters (TBM) and raised bore machine cutters (RBM), said grinding apparatus consisting of a box having a table for holding one or more bits to be ground, a grinding machine carried by an arm or lever system journaled on a stand attached to the box, said table is tiltably mounted within box wherein means are provided to preferably provide side load, optionally adjustable, to said grinding machine when said table is preferably tilted and wherein the table is provided with one or more apertures to hold one or more bits to be ground.
3. A multiple bit holder for use with a grinding apparatus according to claim 1 or claim 2 wherein the bit holder is adjustable to hold different sides of bits and is provided with air actuated locking means.
4. A grinding apparatus according to claims 1 or 2 wherein means are provided to lock a bit within said aperture and means to partially release the pressure to permit the bits to be rotated without full release of the locking means.

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5. Grinding apparatus according to claims 1, 2, 3 or 4 wherein said box is provided with an adjustable splash guard.

6. A grinding apparatus for grinding the hard metal inserts or working tips of drill bits (percussive or rotary), tunnel boring machine cutters (TBM) and raised bore machine cutters (RBM), said grinding apparatus consisting of a grinding machine carried by an arm or lever system journaled on a stand, wherein a cylinder having one end connected to said stand and the other end connected to said arm to provide a side load to the grinding machine to help center the grinding machine over the button to be ground.

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Important Notices

TITLE: GRINDING APPARATUS

BACKGROUND OF THE INVENTION

5 The present invention relates to improvements in
apparatus for grinding the hard metal inserts or working
tips of drill bits (percussive or rotary), tunnel boring
machine cutters (TBM) and raised bore machine cutters (RBM)
and more specifically, but not exclusively, for grinding
10 the tungsten carbide cutting teeth or buttons of a drill
bit or cutter.

 In drilling operations the cutting teeth
(buttons) on the drill bits or cutters become flattened
(worn) after continued use. Regular maintenance of the
15 drill bit or cutter by regrinding (sharpening) the buttons
to restore them to substantially their original profile
enhances the bit/cutter life, speeds up drilling and
reduces drilling costs. Regrinding should be undertaken
when the wear of the buttons is optimally one third to a
20 maximum of one-half the button diameter.

 Different manual and semi-automatic grinding
machines are known for grinding button bits/cutters (see
for example U.S. Patent No. 5,193,312; 5,070,654). In a
conventional type of machine a grinding cup having the
25 desired profile is rotated at high speed to grind the
carbide button and the face of the bit/cutter surrounding
the base of the button to restore the button to
substantially its original profile for effective drilling.

30 BRIEF DESCRIPTION OF THE DRAWINGS

 In order that the invention may be more clearly
understood, the preferred embodiment thereof will now be
described in detail by way of example, with reference to
35 the accompanying drawings, in which:

PHOTO 1 is a front view of a grinding apparatus according
to the present invention having a box and tilting

- table and grinding machine carried for vertical and horizontal adjustment by an arm or lever system journaled on a stand;
- 5 PHOTO 2 is a close-up view of the box and tilting table of the grinding apparatus of PHOTO 1;
- PHOTO 3 is a view of the left side of the box of PHOTO 1 showing the means of tilting the table;
- PHOTO 4 is a view of the right side of the box of PHOTO 1;
- 10 PHOTO 5 is a close-up view of the top of the tilting table of the grinding apparatus of PHOTO 1;
- PHOTO 6 is a side view of the grinding machine carried for vertical and horizontal adjustment by an arm or lever system of PHOTO 1;
- 15 PHOTO 7 is a close-up of the grinding machine of PHOTO 1;
- PHOTO 8 is a close-up of the control panel for setting the balance pressure and feed pressure for the grinding machine of PHOTO 7;
- 20 PHOTO 9 is a view of the back of the grinding apparatus of PHOTO 1;
- PHOTO 10 is a close up view from the front of the cylinder for providing backpressure to the grinding machine;
- 25 PHOTO 11 is a close up view from the rear of the cylinder of PHOTO 10;
- Fig. 1 is a side plan view partly in section of the grinding machine carried for vertical and horizontal adjustment by an arm or lever system; and
- 30 Fig. 2 is a top plan view of the grinding machine and arm or lever system of Fig. 1.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

35 With reference to the PHOTOS and Figs one embodiment of a grinding apparatus according to the present invention is generally indicated at 1. The grinding

apparatus 1 consists of a box 2 having a table 3 for holding one or more bits to be ground. A grinding machine 4 is carried by an arm or lever system, generally indicated at 5, journaled on a stand 6 attached to the rear of box 2. As best seen in PHOTOS 3 and 9 a compressed air feed 7 is provided to operate various aspects of the grinding apparatus as discussed in detail below.

Table 3 is tiltably mounted within box 2 at pivot points 8,9 on each side of the box 2 (see PHOTOS 3 and 4). The table 3 is provided with one or more apertures 10 to hold one or more bits to be ground. A bit(s) (not shown) is positioned in aperture 10. The bit is held in place by pressure plate 11 controlled by a locking cylinder 12. The locking cylinder can be backed off slightly to rotate the bit (to the next button to be ground) within the aperture 10 without full release of the pressure on the locking cylinder. If the button to be ground is a gauge button, it is mounted in the bit at an angle relative to the face of the bit. The grinding machine 4 in order to properly regrind a worn button must be aligned over the longitudinal axis of the button. Accordingly to regrind the gauge buttons, table 3 is tilted to correspond to the angle at which the gauge buttons are mounted in the bit. The means of tilting table 3 is best illustrated with reference to PHOTO 3. An arced slot 13 is provided in the side of box 2. A scale 14 is preferably provided to indicate the angle at which the table 3 will be tilted. A stop 15 is positioned within the slot 13 at the desired angle and locked in place by lever 16. Once set for a particular bit type, the angle is fixed and doesn't have to be reset for each bit or button to be reground. A cylinder 17 is provided on the side of the box 2 and the end 18 of the cylinder rod 19 is connected to the side 20 of table 3 at point 21. When air is fed to cylinder 17, extension of the rod 19 will tilt table 3 until further extension is prevented by stop 15. As shown in PHOTO 2, controls, generally indicated at 22, for tilting the table and locking the bit(s) in place are

provided at the front of the box. One switch 23 controls the cylinder 17 for tilting the table 3 and a second switch 24 controls the locking cylinder 12 and pressure plate 11. Flow controls are provided to regulate the speed of movement of the table and the pressure plate. The tilting means can be mounted on either side of the box so that two boxes may be mounted side by side.

Large down the hole bits to be reground typically have a relatively long shaft that fits through aperture 10. In order to regrind smaller bits a floor plate 25 that can be pivoted (slid) in and out of position under aperture 10 is provided. Knob 26 and slot 27 in table 3 control the location of the floor plate 25. Adapters for holding multiple small sized bits can be inserted into aperture 10. In PHOTO 5 two different types of adapters are shown. In the left aperture a W-shaped adapter 28 is provided. In the right aperture an air-actuated adapter 29 is illustrated. The adapter 29 has a pair of adjustable outer plates to accommodate different sizes of bits and air actuated locking plates. Use of the adapters eliminates repetitive set up time for the operator.

A splash guard 30 is provided at the front of the box 2 that can be raised and lowered along a slot 31 along each side of the front edge of box 2. A counter balancing spring assists in the ease of operation of splashguard 30. The splashguard 30 can be set and retained at different heights as desired.

The arm system 5 for carrying and positioning grinding machine 4 as noted previously is journaled onto stand 6. With reference to PHOTOS 6 to 11 and Figs. 1 and 2, the arm system 5 consists a first arm section 32 having one end 33 journaled to stand 6. The other end 34 of the first arm section 32 is journaled to the back side 35 of a first control box 36. The first arm section 32 controls the horizontal location of the grinding machine relative to the bit to be reground. To the front side 37 of control box 36 is pivotally mounted a second arm section 38. The second

arm section 38 consists of a pair of parallel arms 39, 40 with one end 41,42 of each arm 39,40 pivotally mounted to the front side 37 of the first control box 36. The other end 43,44 of each arm 39, 40 is pivotally connected to the back side 45 of a second control box 46. The second arm section 38 controls the vertical movement of the grinding machine up and down.

Within the second control box 46, is a rotation motor 47 and bearing arrangement 48 for providing an orbital rotation to grinding machine 4. The grinding machine 4 is attached to control box 46 by means of plates 49, 50. The grinding machine 4 has an electric motor/grinding head in the embodiment shown but can also utilize an air or hydraulic motor, etc. Each of the plates 49, 50 is provided with an acruate slot 51, 52. The angle of attachment of the grinding machine 4 relative to control box 46 can be adjusted by means of slots 51, 52 and locking levers 53. By having the grinding machine/grinding head oscillate slightly off vertical, nipple formation on the button being reground is minimized and uneven wear on the grinding cup avoided.

Within the first control box 36, is a cylinder 54 connected to an end 42 of the lower arm 40 of the second arm section 38. The end 42 of lower arm 40 extends out from the pivot point 55 at which the lower arm 40 is connected to the first control box 36. Cylinder 54 provides a balance pressure to the second arm section when the grinding machine is not in use and grinding pressure/feed when in use. The grinding balance pressure and pressure/feed can be adjusted.

When grinding buttons the self-centering aspects of the grinding machine tend to center the grinding machine over the highest point on the button. On buttons where wear is uneven, typically gauge buttons, this may result in regrinding the button off center from its vertical axis. To substantially center the grinding machine over the longitudinal axis of the button, the first arm section 32

is provided with a cylinder 56 having one end 57 connected to stand 6 and the other end 58 connected to the bottom 59 of the first arm section 32. The cylinder 56 provides a side load to grinding machine 4 to help center the grinding machine over the button. In the embodiment shown, the cylinder 56 is automatically activated when the table is tilted by the pilot feed from cylinder 17 through valve 60. The side load biases the grinding machine to grind more on the inside of the gauge buttons thereby tending to shift the grinding machine over the true center of the button. The suitable side load can be provided by other means such as counter weights, etc.

In addition, variations of the same above described principle of biased side loads or counter balancing can also be used to allow for grinding at angles other than vertical. Combinations of variations of the above described principle of biased side loads or counter balancing can be used to substantially eliminate the need for tilting/pivoting the bit when switching between grinding of face buttons and gauge buttons. This principle would be ideal in cases where tilting or pivoting of the bit is difficult due to size, weight, etc.

Having illustrated and described a preferred embodiment of the invention and certain possible modifications thereto, it should be apparent to those of ordinary skill in the art that the invention permits of further modification in arrangement and detail.

It will be appreciated that the above description related to the preferred embodiment by way of example only. Many variations on the invention will be obvious to those knowledgeable in the field, and such obvious variations are within the scope of the invention as described and claimed, whether or not expressly described.